

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Currently Amended) An electrosag-cold hearth system for refining or producing a metal, comprising:

a cold hearth vessel for melting and holding a pool of molten liquid metal;

a liquid slag layer floating on top of the pool of molten liquid metal;

a source of metal comprising a consumable electrode;

a non-consumable electrode in contact with the liquid slag layer, wherein a portion of the non-consumable electrode surrounds a portion of the consumable electrode;

an ingot mold for receiving molten metal from the pool of molten metal, laterally off-set from the source of metal;

a power supply for electrically heating the liquid slag layer; and

a flow-over dam between the cold hearth vessel and the ingot mold.

2. (Canceled)

3. (Currently Amended) The system of claim [[2]] 1, further including means for advancing the consumable electrode toward and into contact with the liquid slag layer.

4. (Original) The system of claim 1, wherein the source of metal comprises at least one of metal revert and virgin metal material.

5. (Original) The system of claim 1, wherein the cold hearth vessel comprises a liquid-cooled reservoir.

6. (Original) The system of claim 5, wherein the cold hearth vessel is a water-cooled metal reservoir.

7. (Original) The system of claim 1, wherein the liquid slag layer comprises at least one material selected from the group consisting of calcium metal, calcium halides, calcium oxide, and mixtures thereof.

8. (Original) The system of claim 1, wherein the flow-over dam comprises a wall which permits the flow of liquid metal into the ingot mold, but substantially prevents the flow of inclusions into the ingot mold.

9. (Original) The system of claim 8, wherein the wall comprises a metallic material, and is liquid-cooled.

10. (Currently Amended) The system of claim ~~[[2]]~~ 1, wherein the power supply comprises an electric supply means adapted to supply current to the consumable electrode and through the liquid slag layer in the cold hearth vessel, thereby keeping the liquid slag layer molten, while melting an end of the consumable electrode in contact with the liquid slag layer.

11. (Canceled)

12. (Currently Amended) The system of claim [[11]] 1, further including means for supplying current to the liquid slag layer through the non-consumable electrode.

13. (Original) The system of claim 12, wherein the means for supplying current comprises a second power supply.

14. (Canceled)

15. (Canceled)

16. (Currently Amended) The system of claim [[11]] 1, wherein the non-consumable electrode comprises a portion of the cold hearth vessel and the ingot mold, and wherein the non-consumable electrode is electrically separated from the cold hearth vessel and the ingot mold by an insulator.

17. (Currently Amended) The system of claim [[11]] 1, wherein the non-consumable electrode is mounted on a structure which allows the non-consumable electrode to move relative to the liquid slag layer.

18. (Canceled)

19. (Previously Presented) The system of claim 17, wherein the electrically conductive material comprises graphite or copper material.

20. (Previously Presented) The system of claim 17, wherein the electrically conductive material is covered or capped by a refractory metal.

21. (Original) The system of claim 1, wherein the metal comprises at least one element selected from the group consisting of titanium, nickel, aluminum, tin, antimony, beryllium, boron, gallium, molybdenum, niobium, tantalum, thorium, zirconium, vanadium, iridium, osmium, rhenium, uranium, and rare earth elements.

22. (Original) The system of claim 1, wherein the metal comprises titanium or a titanium alloy.

23. (Previously Presented) The system of claim 22, wherein the titanium alloy comprises titanium and at least one metal selected from the group consisting of aluminum and vanadium.

24. (Previously Presented) A system according to claim 1, further comprising a feed system for supplying a source material to the liquid slag layer.

25. (Previously Presented) The system of claim 24, wherein the source material comprises at least one salt.

26. (Previously Presented) The system of claim 25, wherein the at least one salt comprises a titanium salt.

27. (Previously Presented) The system of claim 24, wherein the source material comprises a liquid or a gas, and wherein the source material communicates with the liquid slag layer through a passageway.

28. (Previously Presented) The system of claim 24, wherein the source material comprises a metal material.

29. (Previously Presented) The system of claim 28, wherein the metal material comprises titanium or a titanium alloy.

30. (Previously Presented) The system of claim 28, wherein the metal material comprises at least one of metal revert and virgin metal material.

31. (Canceled)

32. (Currently Amended) An electrosag-cold hearth system for refining or producing a metal or metal alloy, comprising a cold hearth vessel capable of holding a pool of liquid metal and an overlying slag layer; a power supply for electrically heating the slag layer; ~~and an ingot mold that communicates with the cold hearth through a flow-over dam that allows the liquid metal to flow from the hearth to the ingot mold while substantially preventing the flow of inclusions to the ingot mold, wherein a~~ source of raw metal consumable electrode situated above the cold hearth [[is]] and laterally off-set from the ingot mold; and a non-consumable electrode in contact with the slag layer, wherein the non-consumable electrode comprises a portion of the cold hearth vessel and the ingot mold, and wherein the non-consumable electrode is electrically separated from the cold hearth vessel and the ingot mold by an insulator.

33. (Currently Amended) An electroslag-cold hearth system for refining titanium or a titanium alloy, comprising:

a cold hearth vessel for melting and holding a pool of molten liquid titanium or titanium alloy;

a calcium-based liquid slag layer overlying the pool of molten liquid titanium or titanium alloy;

a consumable electrode formed of titanium or titanium alloy, having an end in contact with the liquid slag layer;

an ingot mold for receiving the molten titanium or titanium alloy, laterally off-set from the consumable electrode, and situated below a portion of the liquid slag layer;

a power supply for electrically heating the liquid slag layer and the consumable electrode;

a flow-over dam between the cold hearth vessel and the ingot mold; and

a non-consumable, electrically conductive electrode, in contact with the liquid slag layer, and electrically coupled to the power supply for providing additional thermal energy to the slag layer.

34. (Currently Amended) An electroslag-cold hearth system for electrolytically producing titanium or a titanium alloy, comprising:

a cold hearth vessel for melting and holding a pool of molten liquid titanium or titanium alloy;

a calcium-based liquid slag layer overlying the cold hearth vessel;

a source for containing at least one titanium salt in liquid or gaseous form, wherein the salt can be electrochemically reduced to the titanium or titanium alloy when introduced into the liquid slag layer;

an ingot mold for receiving the molten titanium or titanium alloy, laterally off-set from the cold hearth vessel, and communicating therewith;

a power supply for electrically heating the liquid slag layer;

a flow-over dam between the cold hearth vessel and the ingot mold;

a consumable electrode formed of titanium or titanium alloy, and positioned so that it can be lowered into contact with the liquid slag layer, to allow for the refining of the titanium or titanium alloy while additional titanium or titanium alloy material is being electrolytically produced from the salt; and

a non-consumable, electrically conductive electrode, in contact with the slag layer, and electrically coupled to the power supply for providing additional thermal energy to the liquid slag layer.

35. (Previously Presented) The electroslag-cold hearth system of claim 34, further comprising a feed system for directing titanium-based revert material or virgin titanium material to the liquid slag layer.

36-49. (Canceled)